

Response Under 37 C.F.R. §1.116 - Expedited Examining Procedure

Page 2 of 9

Serial No.: 09/560,268

Confirmation No.: 2517

Filed: April 26, 2000

For: COMPOSITIONS FOR SELECTIVELY ETCHING AGAINST COBALT SILICIDE (As Amended)

etching composition has an etch rate greater than about 1000 Å/minute for cobalt. Claims 73 and 79 recite that the etching composition has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride. Claims 77 and 89 recite that the etching composition has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride and an etch rate greater than about 1000 Å/minute for cobalt.

In contrast to independent claims 68, 73, 77, 79, 84, and 89, Shiramizu does not teach any etch rates for its disclosed cleaning solution. The Examiner, however, alleges that the cleaning solution taught by Shiramizu would inherently have a metal nitride etch rate of about 50 Å/minute to 250 Å/minute and a cobalt etch rate greater than about 1000 Å/minute because it is made from essentially the same concentration of each chemical as that of the claimed invention. Applicants traverse these allegations.

To establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill (emphasis added). *In re Robertson*, 49 U.S.P.Q.2d 1949, 1950-51 (Fed. Cir. 1999); *see also Crown Operations Int'l Ltd. v. Solutia Inc.*, 62 U.S.P.Q.2d 1917 (Fed. Cir. 2002). Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient. *Id.* In *Crown Operations*, the Federal Circuit refused to adopt the approach suggested by plaintiffs that "if a prior art reference disclosed the same structure as claimed by a patent, the resulting property . . . should be assumed." *See Crown Operations Int'l Ltd. v. Solutia Inc.*, 62 U.S.P.Q.2d at 1922.

In this case, Applicants submit that the etch rates claimed by the present invention are not necessarily present in the teachings of Shiramizu for at least the following reasons. First, as stated above in *Crown Operations*, just because Shiramizu may disclose a cleaning solution having a similar structure as the etching composition claimed in the present invention does not necessarily imply that the cleaning solution of Shiramizu etches either metal nitride or cobalt at the claimed etch rates. As stated above, Shiramizu is silent regarding etch rates or etch rates for

Response Under 37 C.F.R. §1.116 - Expedited Examining Procedure

Page 3 of 9

Serial No.: 09/560,268

Confirmation No.: 2517

Filed: April 26, 2000

For: COMPOSITIONS FOR SELECTIVELY ETCHING AGAINST COBALT SILICIDE (As Amended)

metal nitride and cobalt. Further, one skilled in the art would not recognize such etch rates in Shiramizu.

Even though Shiramizu recites similar components used in the etching composition taught in claims 68, 73, 77, 79, 84, and 89, nothing in Shiramizu would lead one skilled in the art to an understanding that the specific etch rates for either cobalt and/or metal nitride are necessarily present. Specifically, there is no teaching in Shiramizu that the recited cleaning solution could provide an etch rate approaching those recited in claims 68, 73, 77, 79, 84, and 89. In other words, just because Shiramizu has similar components in the cleaning solution does not necessarily mean that this solution can necessarily be used to achieve specific etch rates for specific materials as recited in claims 68, 73, 77, 79, 84, and 89. As a result, one skilled in the art would not recognize that an etch rate as recited in the claims would necessarily be present with the composition recited in Shiramizu.

As Shiramizu fails to recite etch rates or etch rates of metal nitride and cobalt, it would appear that the Examiner is relying only upon a probability in asserting that the composition recited in Shiramizu provides etch rates as described in the pending claims. As discussed above, however, probabilities are not sufficient for supporting the Examiners inherency argument.

Further, Shiramizu teaches cleaning methods and cleaning systems for cleaning a semiconductor substrate, not etching compositions for etching metal nitride and/or cobalt as claimed by the present invention. In other words, one skilled in the art would not recognize that the cleaning solution taught by Shiramizu would be able to etch metal nitrides and/or cobalt at the etch rates claimed because cleaning solutions and etching solutions perform different functions. Specifically, the section of Shiramizu pointed to by the Examiner teaches a cleaning process for removing metallic contaminants on the surface of a semiconductor substrate. See Shiramizu, column 1, lines 26-28. The term "metallic" is defined as "pertaining to metals in their uncombined forms." Grant et al., *Chemical Dictionary*, 5th ed., pg. 364 (1987) (attached in response to the previous Office Action as Appendix A). In other words, Shiramizu teaches a cleaning process for removing only metals in their uncombined form, which would not include removing metal nitrides. Therefore, one skilled in the art would not recognize that the cleaning

Response Under 37 C.F.R. §1.116 - Expedited Examining Procedure

Page 4 of 9

Serial No.: 09/560,268

Confirmation No.: 2517

Filed: April 26, 2000

For: COMPOSITIONS FOR SELECTIVELY ETCHING AGAINST COBALT SILICIDE (As Amended)

solution allegedly taught by Shiramizu would etch metal nitrides at the rates claimed by the present invention.

Finally, the Examiner asserts that Applicants' arguments stating that the Shiramizu solution does not necessarily have the same etch rate as the claims is found unpersuasive because there is no factual evidence to support such arguments. Applicants respectfully traverse this assertion and submit that the burden of proof is on the party asserting the inherency argument. As discussed in *Crown Operations*, Crown urged the Federal Court to accept the proposition that if a prior art reference discloses the same structure the resulting property should be assumed. *Crown Operations Int'l Ltd. v. Solutia Inc.*, 62 U.S.P.Q.2d 1917 at p. 1922. The Federal Circuit declined to adopt this approach, stating that if the property is inherently disclosed in the document, it must be necessarily present and a person of ordinary skill in the art would recognize its presence. *Id.* at p. 1922-23. The Court went on to say that the party asserting the inherent disclosure "bears an evidentiary burden to establish that the limitation was necessarily present." *Id.* at p. 1923. So, Applicants respectfully submit that it is the Examiner's burden, not the Applicants' burden, to prove that the asserted etch rates are actually present in Shiramizu.

For at least the above reasons, Applicants submit that the claimed etch rates are not necessarily present in Shiramizu, and therefore, the claimed etch rates are not inherently taught by Shiramizu. Because Shiramizu does not teach each and every element of independent claims 68, 73, 77, 79, 84, and 89, such claims are not anticipated by Shiramizu.

In regard to dependent claims 69-70, 72, 74-75, 78, 80-81, 83, 85-86, 88, 90-91, and 93, which depend from one of independent claims 68, 73, 77, 79, 84, and 89, such claims are not anticipated by Shiramizu for the same reasons as presented above for independent claims 68, 73, 77, 79, 84, and 89. In addition, claims 69-70, 72, 74-75, 78, 80-81, 83, 85-86, 88, 90-91, and 93 each recite additional elements that further support patentability when combined with independent claims 68, 73, 77, 79, 84, and 89.

For at least the above reasons, Applicants submit that claims 68-70, 72-75, 77-81, 83-86, 88-91, and 93 are not anticipated by Shiramizu. Reconsideration and withdrawal of this rejection are, therefore, respectfully requested.

Response Under 37 C.F.R. §1.116 - Expedited Examining Procedure

Page 5 of 9

Serial No.: 09/560,268

Confirmation No.: 2517

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For: COMPOSITIONS FOR SELECTIVELY ETCHING AGAINST COBALT SILICIDE (As Amended)

The 35 U.S.C. § 103(a) Rejection of claims 64, 65, 67, 71, 76, 82, 87, and 92-95

The Examiner rejected claims 64, 65, 67, 71, 76, 82, 87, and 92-95 under 35 U.S.C. §103(a) as being unpatentable over Shiramizu as applied to claims 68, 73, 81, 86, and 91 above.

Applicants traverse this rejection and submit that claims 64, 65, 67, 71, 76, 82, 87, and 92-95 are not *prima facie* obvious for at least the following reasons. To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art references must teach or suggest all the claim limitations. See M.P.E.P. § 2143.

Claims 64, 65, 67 and 94-95

Claims 64 and 94 are not *prima facie* obvious in view of Shiramizu for several reasons. First, Shiramizu fails to teach or suggest all the elements recited in claims 64 and 94. For example, Shiramizu fails to teach or suggest an etching composition that comprises a mineral acid, a peroxide, and deionized water at a ratio in a range of about 1:1:25 (mineral acid:peroxide:deionized water) to about 1:1:10 (mineral acid:peroxide:deionized water), as recited in claims 64 and 94.

Second, there is no motivation or suggestion given to modify the disclosed cleaning solution such that it includes a range of about 1:1:25 to about 1:1:10 as recited in claims 64 and 94. One skilled in the art would not be motivated to modify the cleaning solution of Shiramizu to etch metal nitrides and/or cobalt as is provided by the present invention.

Finally, the Examiner has asserted that "one skilled in the art would find it obvious to determine the chemical ratio through test runs depending on what type of material the solution is used on, in order to achieve a solution to remove metal contaminations or etch metal with an expected of reasonable result." Applicants respectfully traverse this assertion.

The Examiner asserts, essentially, that it would have been "obvious to try" different chemical ratios through "test runs" to arrive at the chemical ratios recited in pending claims 64

Response Under 37 C.F.R. §1.116 - Expedited Examining Procedure

Page 6 of 9

Serial No.: 09/560,268

Confirmation No.: 2517

Filed: April 26, 2000

For: COMPOSITIONS FOR SELECTIVELY ETCHING AGAINST COBALT SILICIDE (As Amended)

and 94. Applicants respectfully submit, however, that "obvious to try" is an impermissible standard to use in an obviousness determination. *In re Antonie*, 559 F.2d 618, 195 U.S.P.Q. 6 (C.C.P.A. 1977); *In re Tomlinson et al.*, 363 F.2d 928, 150 U.S.P.Q. 623 (C.C.P.A. 1966). There must be a suggestion or teaching in the prior art that Applicants' claimed invention could or should be prepared. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (C.A.F.C. 1991); *In re O'Farrell*, 853 F.2d 894, 7 U.S.P.Q.2d 1673 (C.A.F.C. 1988). It appears that it is only in hindsight, e.g., picking and choosing among the disclosure of the cited art with knowledge of Applicants' disclosure, that the Examiner can arrive at the conclusion that Applicants' invention is obvious.

Claims 65 and 67 are patentable by reason of their dependency on patentable claim 64.

Claim 95 is patentable by reason of their dependency on patentable claim 94.

For at least the above reasons, Applicants submit that claims 64, 65, 67, and 94-95 are not *prima facie* obvious in view of Shiramizu. Reconsideration and withdrawal of this rejection are, therefore, respectfully requested.

Claims 71, 76, 82, 87, and 92-93

Claims 71, 76, 82, 87, and 92-93 are not *prima facie* obvious because Shiramizu does not teach or suggest all of the elements of such claims. For example, by reason of their respective dependencies, claims 71, 76, 82, 87, and 92-93 each recite etch rates for metal nitride and/or cobalt. For example, claims 71 and 87 recite that the claimed etching composition has an etch rate greater than about 1000 Å/minute for cobalt. Claims 76 and 82 each include the element that the etching composition has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride. Further, claims 92-93 recite that the etching composition has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride and an etch rate greater than about 1000 Å/minute for cobalt. As stated above, Shiramizu is silent regarding etch rates or etch rates for etching metal nitride and/or cobalt. Therefore, Shiramizu does not teach all of the elements of claims 71, 76, 82, 87, and 92-93.

Response Under 37 C.F.R. §1.116 - Expedited Examining Procedure

Page 7 of 9

Serial No.: 09/560,268

Confirmation No.: 2517

Filed: April 26, 2000

For: COMPOSITIONS FOR SELECTIVELY ETCHING AGAINST COBALT SILICIDE (As Amended)

Further, as described above, one skilled in the art would not be motivated to modify the cleaning solution taught by Shiramizu such that it etched metal nitride and/or cobalt at the recited etch rates.

For at least the above reasons, Applicants submit that claims 71, 76, 82, 87, and 92-93 are not *prima facie* obvious in view of Shiramizu. Reconsideration and withdrawal of this rejection are, therefore, respectfully requested.

The 35 U.S.C. § 103(a) rejection of claims 64, 65, and 67-95

The Examiner rejected claims 64, 65, and 67-95 under 35 U.S.C. § 103(a) as being unpatentable over Nakano et al. (U.S. Patent No. 6,110,839) in view of Shiramizu (U.S. Patent 6,116,254). Applicants traverse this allegation.

Applicants submit that claims 64, 65, and 67-95 are not *prima facie* obvious because the cited references do not teach or suggest all of the elements of claims 64, 65, and 67-95. As stated above, Applicants submit that Shiramizu does not teach all of the elements of claims 64, 65, and 67-95. For example, Shiramizu does not teach an etching composition that includes a ratio in a range of about 1:1.25 to about 1:1.10 (e.g., claim 64). Further, Shiramizu does not teach etch rates for etching cobalt (e.g., claim 68), etching metal nitrides (e.g., 73), or etching both cobalt and metal nitride (e.g., claim 77).

The addition of Nakano et al. does nothing to address this deficiency already present in Shiramizu. Nakano et al. does not teach etching compositions that can etch two different materials, e.g. metal nitride and cobalt, at different etch rates. Nakano et al. also fails to teach or suggest etching compositions that can provide different etch rates for metal nitride and cobalt. Instead, the cleaning solution of Nakano et al. relied upon by the Examiner is used to remove metallic impurities. See, e.g., Nakano, column 1, lines 54-57. In other words, the cleaning solution in Nakano et al. does not inherently describe the claimed etch rates because Nakano et al. does not teach an etching solution for etching metal nitride and/or cobalt. Inherency may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient. *In re Robertson*, 49 U.S.P.Q.2d 1949,

Response Under 37 C.F.R. §1.116 - Expedited Examining Procedure

Page 8 of 9

Serial No.: 09/560,268

Confirmation No.: 2517

Filed: April 26, 2000

For: COMPOSITIONS FOR SELECTIVELY ETCHING AGAINST COBALT SILICIDE (As Amended)

1950-51 (Fed. Cir. 1999).

For at least the above reasons, Applicants submit that claims 64, 65, and 67-95 are not *prima facie* obvious in view of the cited references. Reconsideration and withdrawal of this rejection are, therefore, respectfully requested.